

REMARKS

Status of the Claims

Prior to entry of this Amendment and Response, claims 11-20, 22, and 25-43 are pending in the application. Claims 11, 15, 17, and 22 are independent claims under consideration. All of the pending claims stand rejected or objected to as follows:

- Claims 11-16 and 25-35 stand rejected under 35 U.S.C. §112, first paragraph, as allegedly failing to comply with the written description requirement;
- Claims 1-16, 25-35, 40, and 41 stand rejected under 35 U.S.C. §112, second paragraph, as allegedly being indefinite;
- Claims 11-20, 22, and 25-43 stand provisionally rejected under the judicially-created doctrine of obviousness-type double patenting as being unpatentable over claims of co-pending U.S.S.N. 09/730,117 (now U.S. Patent No. 6,713,173);
- Claims 11-20, 22, 25-28, 31-33, 36-39, 42, and 43 stand rejected under 35 USC §103(a) as allegedly unpatentable over U.S. Patent No. 4,452,896 to Blakemore *et al.* (“Blakemore”) in view of U.S. Patent No. 5,491,219 to Mann (“Mann”) and a publication by F.C. Meldrum *et al.* entitled “Magnetoferritin: In Vitro Synthesis of a Novel Magnetic Protein” (“Meldrum”), further in view of U.S. Patent No. 4,666,773 to Kitamoto (“Kitamoto”) and U.S. Patent No. 5,505,996 to Nagayama (“Nagayama”); and
- Claims 15, 16, 31-35, and 40-41 stand rejected under 35 USC §103(a) as allegedly unpatentable over U.S. Patent No. 5,965,267 to Nolan *et al.* (“Nolan ‘267’”) in view of Nagayama.

In view of the foregoing amendments and following remarks, reconsideration and withdrawal of all grounds of rejection and objection are respectfully requested.

Amendments to the Claims

In order to more particularly point out and distinctly claim the subject matter Applicants regard as his invention, Applicants hereby amend independent claims 11, 15, 17, and 22, without prejudice and without any intention of disclaiming equivalents thereof, and adds new claims 44-

75. Also, claims 13, 14, 19, 20, 40, and 41 are amended to correct typographical errors therein. No new matter has been introduced; support for the amendments and the new claim is found throughout the specification, for example, on page 1, lines 5-19; page 2, lines 13-31; page 3, line 19 to page 5, line 14; page 8, lines 22-23, and page 9, lines 22-29.

Rejection Under 35 U.S.C. §112, First Paragraph

The Office Action asserted, on page 2, that the phrase “substantially uniformly spaced apart” in claims 11 and 15 is considered to be new matter. Without acquiescing to or agreeing with this rejection, Applicants respectfully submit that claims 11 and 15, as amended, properly comply with the written description requirement of 35 U.S.C. §112, first paragraph, and request reconsideration and withdrawal of the rejection of claim 11 and 15, and all claims dependent therefrom.

In addition, with respect to dependent claim 16, Applicants respectfully point out that the support therefor can be found on page 5, lines 2-5 of the specification, and request reconsideration and withdrawal of the rejection of this claim under 35 U.S.C. §112, first paragraph.

Rejection Under 35 U.S.C. §112, Second Paragraph

The Office Action asserted, on page 3, that claims 11-16, 25-35, 40, and 41 are indefinite for failing to particularly point out and distinctly claim the subject matter Applicants regard as their invention. Applicants respectfully traverse this rejection to the extent it is maintained over these claims, as amended. Specifically, claim 11 and 15 have been amended to clarify that each of the spaced apart particles has been formed and is at least partially encased within a cavity of an organic macromolecule having a wall of a predetermined thickness, the distance between adjacent particles being substantially equal to about twice the thickness of the wall. Also, claim 15 have been amended to clarify that the distance between adjacent spaced apart particles substantially equals to about twice the thickness of the coating surrounding each particle. In addition, claim 15 has been amended to clarify that the coating surrounds each particle, rather than the plurality of particles.

Finally, claims 40 and 41 have been amended to correct typographical errors therein. Specifically, these claims, as amended, depend from claim 17, and, thus, are no longer duplicates of claims 34 and 35.

Thus, Applicants submit that claims 11-16, 25-35, 40, and 41, as amended, particularly point out and distinctly claim the subject matter which Applicants regard as their invention. Therefore, reconsideration and withdrawal of the rejection under 35 U.S.C. §112, second paragraph, are respectfully requested.

Double Patenting Rejection

Claims 11-20, 22, and 25-43 stand rejected under the judicially created doctrine of obviousness-type double patenting over all claims of U.S.S.N. 09/730,117. Applicants respectfully request that this rejection be held in abeyance until such time as the claims are otherwise allowable. At that time, Applicants will consider filing a terminal disclaimer to overcome the double patenting rejection. Moreover, now that U.S.S.N. 09/730,117 has issued as U.S. Patent No. 6,713,173, Applicants request that this patent, rather than the application, be considered.

Rejections Under 35 U.S.C. §103(a)

A. Blakemore in view Mann and Meldrum further in view of Kitamoto and Nagayama

Claims 11-20, 22, 25-28, 31-33, 36-39, 42, and 43 stand rejected under 35 USC §103(a) as allegedly unpatentable over Blakemore in view Mann and Meldrum further in view of Kitamoto and Nagayama. In particular, the Office Action states, on page 5, that Blakemore discloses the forming of ferromagnetic/magnetizable particles in a protein molecule, but does not disclose that each of the particles had been formed in and is at least partially encased within a cavity of an organic macromolecule. The Office Action goes on to assert that Mann and Meldrum teach forming magnetite or maghemite in apoferritin, and contends that it “would have been obvious to one of ordinary skill in the art to form ferromagnetic/magnetizable particles within an apoferritin cavity as taught by Meldrum in order to obtain uniform particles.” Further, the Office Action states that “[i]t would have been obvious to one of ordinary skill in the art to deposit the nanometer size magnetic particles as taught by Meldrum on a substrate to produce a

magnetic recording medium as suggested by Blakemore, using established methods of Kitamoto et al or Nagayama.”

Applicants respectfully traverse these rejections, because the proposed modification of Blakemore in view of teachings in Mann, Meldrum, Kitamoto, and Nagayama is incompatible with Blakemore’s approach, and, not surprisingly, no motivation to combine or modify is present in any of the cited references.

It is well settled that, to combine references in order to render a claim obvious under 35 U.S.C. § 103(a) or to establish a *prima facie* case of obviousness, there must be some suggestion or motivation to do so found in the references themselves or in the knowledge generally available to one of ordinary skill in the art that lies outside the disclosure of the patent application. See, e.g., MPEP §2142 (8th Ed., February 2003). Absent this motivation, a rejection under 35 U.S.C. § 103(a) should not be maintained.

It is not a surprise that there is no motivation to combine teachings of Blakemore, Mann, Meldrum, Kitamoto, and Nagayama in order to arrive at the invention recited in Applicants’ claims, because the teachings of these references are wholly inconsistent with the proposed modification. In particular, neither Blakemore, nor Mann, Meldrum, Kitamoto, or Nagayama, or the knowledge of one of ordinary skill in the art provides the requisite suggestion or motivation to replace Blakemore’s bacteria with an organic macromolecule to arrive at the invention recited in Applicants’ claims.

Briefly, Blakemore discloses growing a biologically pure culture of a strain of magnetic bacteria. See Blakemore, col. 2, lines 8-37. Magnetite may be extracted from the magnetotactic cells in the form of a coated chain of single domain particles termed “magnetosomes.” Id. Applicants submit that Blakemore’s teachings are inconsistent with the Applicants’ approach and, accordingly, a skilled artisan would not be motivated to use Blakemore as a starting point to arrive at the claimed invention, and, moreover, discouraged from doing so.

Applicants’ independent claim 11, as amended, recites a magnetizable layer that includes a plurality of spaced apart ferromagnetic particles, each of said ferromagnetic particles having been formed and being at least partially encased within a cavity of an organic macromolecule

having a wall of a predetermined thickness, wherein the distance between adjacent particles substantially equals to about twice the thickness of the wall. Also, independent claim 15, as amended, recites a magnetizable layer that includes a plurality of spaced apart ferromagnetic particles, and a coating having a predetermined thickness surrounding each particle of said plurality of particles, the distance between adjacent particles being substantially equal to about twice the thickness of the coating. Further, independent claim 17, as amended, recites a magnetizable layer that includes a plurality of spaced apart ferromagnetic particles, wherein each of the ferromagnetic particles has been formed within a cavity of an organic macromolecule having a wall of a predetermined thickness, the distance between adjacent particles being substantially equal to about twice the thickness of the wall. Finally, independent claim 22, as amended, recites a method for creating a magnetizable layer comprising a plurality of spaced apart ferromagnetic particles, which includes forming a plurality of at least partially encased ferromagnetic particles within a respective plurality of organic macromolecules, each organic macromolecule having a wall of a predetermined thickness, and depositing said plurality of ferromagnetic particles on a surface, wherein the distance between adjacent particles substantially equals to about twice the thickness of the wall.

First, Applicants submit that Blakemore, Mann, and Meldrum do not provide an enabling disclosure of a data storage medium or a magnetic recording device recited in Applicants' claims. Blakemore merely mentions in passing the concept of using the disclosed particles as an element of a magnetic recording tape. Moreover, Applicants specification clearly sets forth the features of domain separation that avoids undesirable exchange coupling. See Specification, page 1, lines 13-19 and page 3, line 28 to page 4, line 19. In contrast, Blakemore's chains are magnetostatic -- their fields overlap and create a single dipole. See Blakemore, col. 7, lines 9-11. Moreover, these chains are stable and remain as chains are a variety of conditions, such as, e.g., sonification, exposure to detergents, etc. Id at col. 6, lines 37-40. Applicants, thus, submit that skilled artisans would be firmly discouraged from using Blakemore's chains for recording media because the magnetic storage properties of the resulting material would be poor. Further, Mann and Meldrum are completely silent about applicability of their teachings to data storage.

Second, Applicants recognized that monodispersity and single-particle magnetizable domains being spaced-apart at a predetermined distance are important considerations for use in data storage applications. Blakemore's teachings, however, is clearly inapposite to such applications. In particular, the number of Blakemore's particles in each chain varies from about 5 to about 50, averaging about 20 particles per chain. See Blakemore, col. 6, lines 6-8. Adjacent particles in a chain are sometimes in direct contact with each other but usually are separated by a distance of 30-190 Å. Id at col. 6, lines 19-20. In addition, Blakemore himself recognizes that the layers surrounding the particle are uncharacterized, and could be protein, or possibly "true biological membrane (e.g., a lipid bilayer) rather than protein and that additional studies are needed to ascertain the true chemical nature of the layers." Id at lines 24-26 and 31-36. Applicants, therefore, submit that to the extent Blakemore's reports on using his particles as an element of a magnetic recording tape, Blakemore's magnetosomes are not spaced apart in a manner claimed by Applicants.

Further, while the Office Action recognized, on page 5, that Blakemore does not disclose that each of his particles had been formed within a cavity of an organic macromolecule, as recited in Applicants' claims, the Office Action nevertheless went on to assert that Blakemore discloses forming of ferromagnetic/magnetizable particles in a protein molecule, allegedly making it obvious to supplement Blakemore with teachings in Mann and Meldrum of a specific macromolecule, i.e. apoferritin protein. There is substantial doubt, however, as to what the nature and composition of the layer surrounding the magnetic particles in Blakemore actually is.

First, a bacterium is not a protein. Rather, it is a proteinaceous material, which is clearly distinct from a protein *per se*. Moreover, as mentioned above, Blakemore himself states that the layers surrounding the particle are uncharacterized, and could be protein. See Blakemore, col. 8, lines 24-26. Blakemore goes on to state that these layers could be a "true biological membrane (e.g., a lipid bilayer) rather than protein and that additional studies are needed to ascertain the true chemical nature of the layers." Id at lines 31-36.

Thus, even having taking notice of Blakemore, a skilled artisan would be utterly confused as to what type of the surrounding layer is preferred. Therefore, Blakemore clearly fails to motivate such artisan to combine apoferritin teachings of Mann or Meldrum with Blakemore in

preference to any other protein, any proteinaceous or non-proteinaceous substance, or an organic macromolecule.

Finally, turning to Kitamoto and Nagayama, Applicants respectfully submit that these references fail to cure the deficiencies of Blakemore, Mann, and Meldrum because each of Kitamoto and Nagayama does not teach or suggest any particular method for preparing ferromagnetic particles themselves. Moreover, these references are silent with respect to spacing between the particles in the ferromagnetic powder or in the two-dimensional array. Accordingly, in view of the remarks set forth above, Applicants respectfully submit that one of ordinary skill in the art would be discouraged from modifying Blakemore with the teachings of Mann, Meldrum, Kitamoto, and Nagayama to obtain data storage mediums, magnetic recording devices and method for creating thereof recited in Applicants' independent claims, as amended.

Therefore, Applicants submit that the rejection under 35 U.S.C. § 103(a) of independent claims 11, 15, 17, and 22, or any claim dependent therefrom, should not be maintained, and respectfully requests reconsideration and withdrawal of the rejection of claims 11-20, 22, 25-28, 31-33, 36-39, 42, and 43 under 35 U.S.C. § 103(a) as unpatentable over Blakemore in view of Mann and Meldrum, and further in view of Kitamoto and Nagayama.

B. Nolan in view of Nagayama

Claims 15, 16, 31-35, and 40-41 stand rejected under 35 USC §103(a) as allegedly unpatentable over Nolan'267 in view of Nagayama. Applicants respectfully traverse these rejections to the extent they are maintained over the claims, as amended, because Nolan and Nagayama, alone or in combination, fail to teach or suggest every limitation of amended independent claim 15, or claims 16 and 31-35, dependent therefrom. In addition, Applicants have amended claims 40 and 41, and respectfully submit that these claims, now dependent from amended claim 17, are patentable over Nolan in view of Nagayama.

As a preliminary matter, Applicants respectfully submit that the rejection under 35 U.S.C. §103(a) based on Nolan'267 should be withdrawn at least because Nolan'267 does not qualify as a prior art reference to the claims of the present application. Specifically, Applicants respectfully submit that Nolan'267 issued on October 12, 1999, does not qualify as prior art for the purpose

of examining the present application under 35 U.S.C. §102(b), because the priority date of the instant application antedates the issue date of this reference. In particular, as the Examiner is aware, this application is a national stage application of International Application No.

PCT/GB97/03152, filed November 17, 1997, which claims priority to the Great Britain Application No. 9623851.4, filed on November 16, 1996, and, because the date one year prior to the priority date of the present application, i.e. November 16, 1995, antedates Nolan'267's issue date, this reference does not qualify as prior art under 35 U.S.C. §102(b).

With respect to potential 35 U.S.C. §102(e) relevance, the priority date of the present application antedates the filing date of Nolan'267 (March 31, 1998), as well. Therefore, this reference does not qualify as prior art against Applicants' claims under 35 U.S.C. §102(e) either.

Applicants note, however, that Nolan'267 issued from a divisional application of U.S.S.N. 08/389,900 filed on February 17, 1995, and issued as U.S. Patent No. 5,780,101 on July 14, 1998 ("Nolan'101"). Applicants recognize that Nolan'267 shares the disclosure with Nolan'101, and, in order to expedite prosecution of this application, hereby address the rejections based on Nolan'267 as it was a rejection under 35 U.S.C. §102(e)/103(a) based on Nolan'101.

First, Applicants submit that Nolan'101 does not provide an enabling disclosure of a magnetic recording device recited in Applicants' amended independent claim 15, or claims dependent therefrom. Nolan'101 merely alludes to "the area of metal particle magnetic recording media" as one of the application of his particles, and, therefore, is an improper prior art reference to the Applicants' claims.

Moreover, it is well settled that establishing obviousness requires a showing that the prior art provides every limitation of a claim and the invention as a whole. See M.P.E.P. §§ 2142, 2143. As a result, a reference, or combination of references, that does not teach or fairly suggest the invention as a whole cannot render that claim obvious. See, e.g., M.P.E.P. § 2141.02.

Applicants respectfully submit that Nolan'101 and Nagayama fail to render Applicants' claims obvious because none of these references, alone or in combination, teaches or suggests every limitation recited in amended independent claim 15 or in claims 16 and 31-35 dependent therefrom.

Briefly, Nolan'101 discloses a method for the production of carbon nanotubes, carbon encapsulated nanoparticles and other closed carbon structures comprising contacting a dried, reduced and hydrogen free catalyst of a transition metal, or alloy or compound thereof with a gas mixture containing carbon monoxide and an amount of available molecular hydrogen which is insufficient to cause formation of graphite plane edges through capping. See Nolan, col. 4, lines 27-36.

Applicants' amended independent claim 15 recites, *inter alia*, a magnetizable layer that includes a plurality of spaced apart ferromagnetic particles, and a coating having a predetermined thickness surrounding each particle of said plurality of particles, the distance between adjacent particles being substantially equal to about twice the thickness of the coating. Notably, in such magnetizable layer, the coating keeps the magnetizable particles separate from each other when placed on the surface of the medium. Thus, each particle is and remains magnetizably separate from adjacent particles and at spacings determined, at least in part, by the thickness of the coating.

In contrast to Applicants' claims, the closed carbon structures of Nolan'101 are not spaced apart in a manner claimed by Applicants. In fact, Nolan '101 merely reports on a method for the production of closed carbon structures and is silent with respect to spacing between these structures in a magnetic recording device.

Turning to Nagayama, Applicants respectfully submit that this reference fails to cure the deficiencies of Nolan'101 because, just like Nolan'101, Nagayama is silent with respect to spacing between the particles in the ferromagnetic powder or in the resulting two-dimensional array. Also, Applicants note that U.S. Patent No. 5,766,764 to Oli ("Oli"), cited by the Examiner as evidence that nanoscale magnetic particles are prevented from agglomerating when coated with a polymer, or U.S. Patent No. 5,147,841 to Wilcoxon ("Wilcoxon") cited by the Examiner as evidence of use of micelles and surfactants for dispersion of metal particles, also fail to disclose what Nolan'101 lacks, that is, particular spacing between particles in a magnetic recording device, which is determined, at least in part, by the thickness of the coating.

Thus, at least because Nolan'101 does not provide an enabling disclosure of a magnetic recording device recited in Applicants' claims, as well as because neither Nolan'101, nor Nagayama, Oli, or Wilcoxon, alone or in combination, teach or suggest every limitation of amended independent claim 15, Applicants respectfully submit that this claim is allowable. Without acquiescing to the rejection of claims 16 and 31-35, Applicants note that these claims depend directly or indirectly from the allowable base claim, and, thus, also are allowable.

In addition, with respect to claim 31, Applicants notes that Nolan'101's particles are not formed within cavities of carbon nanotubes. Rather, this reference teaches that during formation of the closed carbon structures a carbon coating is applied to the metal particles after these particles are formed. In other words, Nolan'101 starts with magnetic particles and coats them with carbon. Clearly, uniformity of the size claimed by Applicants, can not be expected of Nolan'101's structures because coating will not make non-uniformly shaped and sized magnetic particles into uniform particles.

In light of the foregoing, reconsideration and withdrawal of the rejection under 35 U.S.C. §103(a) are respectfully requested.

CONCLUSION

Applicants respectfully request that the Examiner reconsider the application and claims in light of the foregoing Amendment and Response, and submit that claims 11-20, 22, and 25-43, as well as new claims 44-75 are in condition for allowance. If, in the Examiner's opinion, a telephonic interview would expedite the favorable prosecution of the present application, the undersigned attorney would welcome the opportunity to discuss any outstanding issues, and to work with the Examiner toward placing the application in condition for allowance.

Respectfully submitted,



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